NASA SBIR/STTR Technologies

S2.02-9261 - Optical Precision Deployment Latch

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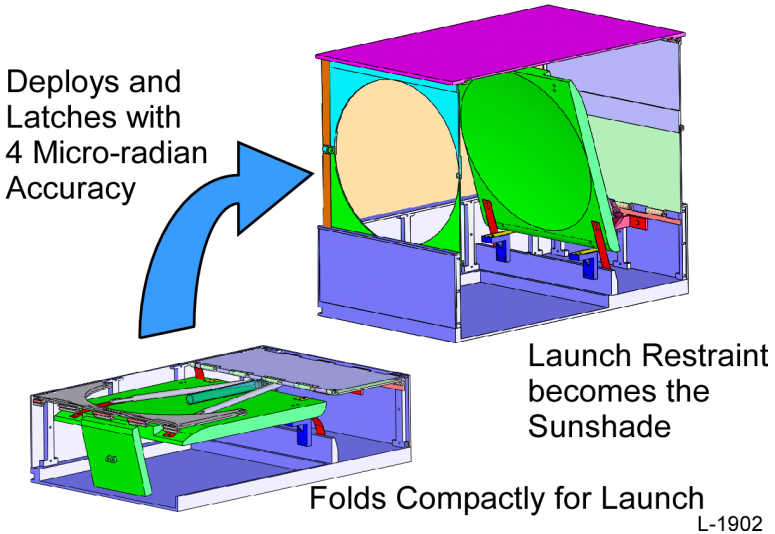
Identification and Significance of Innovation

PSI has developed a simple scalable deployable telescope latching technology. The latch was experimentally shown to have better than 350nm repeatability and stability. PSI also demonstrated an alternative, locking flexure approach. Both approaches provide a small, low-cost latching system with sub-micron positional repeatability and dynamic stability.
During the PhaseII, PSI will determine the limits of the mechanism and locking flexures and then down-select to one approach for full system development. PSI will integrate the precision motion into a complete, large aperture system for a 6U cubesat telescope. In addition to the precision latching components, the team will also address launch restraint, deployment actuation & rate control, and the associated deployment of the sun shade and light baffles.
The results will be an integrated system that will provide all of the systems needed to launch, deploy, and operate high performance optical instruments from small spacecraft platforms.

Estimated TRL at beginning and end of contract: (Begin: 4 End: 6)



Technical Objectives and Work Plan

The goal of the Phase I was to provide NASA with a low-cost latch that precisely locates telescope components and holds them stably during operation. The success of the Phase I effort enables the goal of the Phase II to expand to completely developing all aspects of the telescope and sun-shade deployment system and testing them in a relevant environment as preparation for flight qualification testing. The specific technical objectives and work plan are to:

1. Refine the mechanical latch and its test apparatus to determine the performance limits of the primary latching approach.
2. Refine the locking flexure hinge line and its test configuration to determine the performance limits of the alternative latching approach.
3. Perform a down-selection activity to determine which one of the two approaches will best meet the requirements both of the 6U and of future, larger systems such as an ESPA-class instrument.
4. Incorporate launch restraint features that integrate with the deployment system, the instrument and with the rest of the cubesat
5. Design and build a deployable sunshade and light baffle features. that will keep stray light out of the instrument and assist in the overall thermal management.
6. Test the deployment and precision of the integrated restraint-deployment-latch-sunshade system to demonstrate its suitability for a 6U telescope

NASA Applications

A family of low-cost but precise latch systems would have application to stellar and planetary observatories as well as atmospheric transmission measurement systems. In addition to data gathering, optical systems are also used for high bandwidth communications. Deployed, large area laser communications optics would increase data throughput from interplanetary missions as well as earth orbiting systems.

Non-NASA Applications

There are many DoD and IC applications of earth observing telescopes. The proposed latch technology would also apply to rapidly erected telescope systems for ground soldiers, either for observations or for secure laser communications. In addition to government users, there are a wide range of commercial applications for precision restraint of optical components.

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